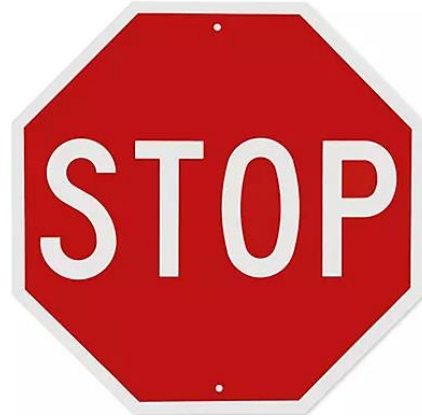
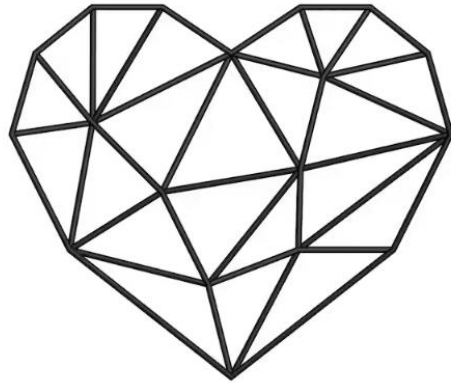


INTRODUCTION TO POLYGONS

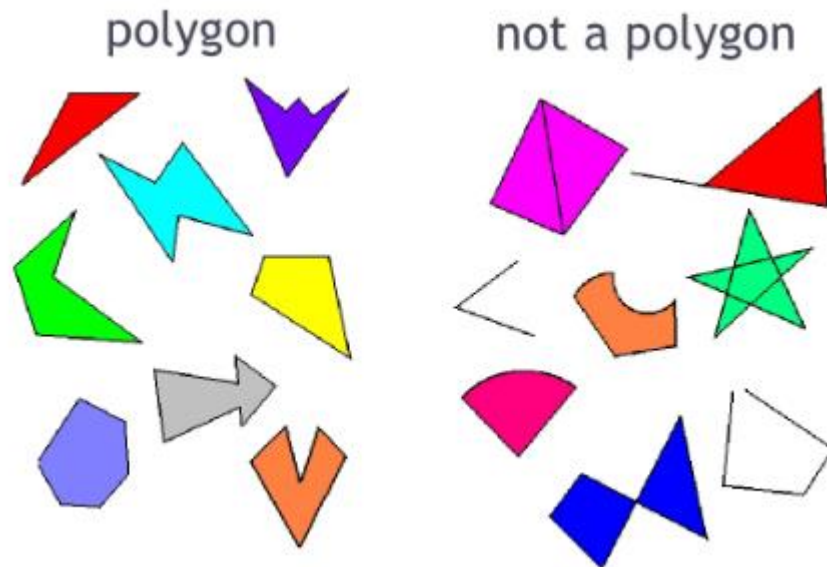
In geometry, a polygon is a flat, two-dimensional shape made up of straight-line segments that connect to form a closed figure. Each polygon has specific properties based on the number of sides, vertices, and angles it has. Here's a detailed explanation of polygons and their features.



Definition of a Polygon

A polygon is a closed figure with the following characteristics:

- It is made up of straight lines (not curves).
- The sides meet only at their endpoints, called vertices.
- It forms a closed shape (all sides connect, leaving no gaps).



Types of Polygons

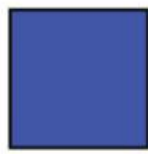
Polygons are categorized based on:

1. Number of sides:

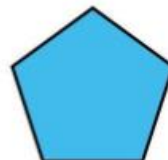
- a. Triangle: 3 sides
- b. Quadrilateral: 4 sides
- c. Pentagon: 5 sides
- d. Hexagon: 6 sides
- e. Heptagon: 7 sides
- f. Octagon: 8 sides
- g. Nonagon: 9 sides
- h. Decagon: 10 sides
- i. The pattern continues for polygons with more sides (e.g., dodecagon for 12 sides).



Triangle



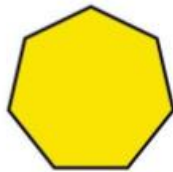
Square



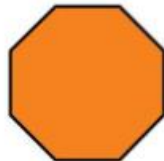
Pentagon



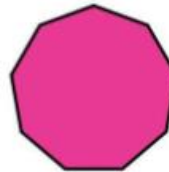
Hexagon



Heptagon



Octagon



Nonagon



Decagon

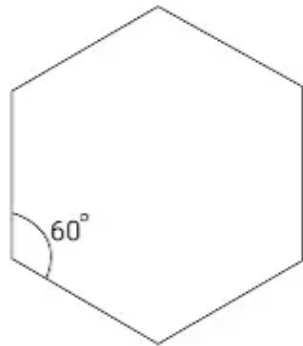
2. Shape:

- Regular polygons: All sides and angles are equal (e.g., equilateral triangle, square).
- Irregular polygons: Sides and angles are not equal.

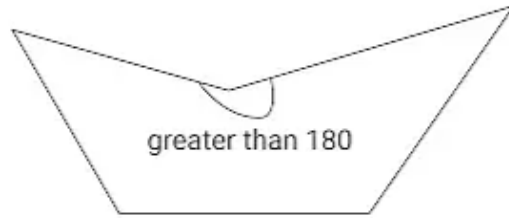
3. Convex or Concave:

- Convex polygon: All interior angles are less than 180° . No "indentations" in the shape.

- Concave polygon: At least one interior angle is greater than 180° . These polygons appear to "cave in."



convex polygon



concave polygon

Properties of Polygons

Sides, Vertices, and Angles

- A polygon with n sides have:
 - n vertices.
 - n interior angles.
 - n exterior angles.

Diagonals of a Polygon

A diagonal is a line segment that connects two non-adjacent vertices of a polygon. The number of diagonals in a polygon with n sides can be calculated using the formula:

Number of diagonals = $n(n-3) / 2$

Example: A hexagon ($n=6$) has:

Diagonals = $6(6-3) / 2 = 6 \cdot 3 / 2 = 9$ diagonals.

Regular vs. Irregular Polygons

Regular Polygons:

- All sides are equal.
- All interior angles are equal.
- Example: Equilateral triangle, square, regular pentagon.

Irregular Polygons:

- Sides and/or angles are not equal.
- Example: A scalene triangle, a rectangle (not a square).